PORTUGUESE JOURNAL OF PEDIATRICS

PERMANYER

Check for updates

CASE REPORT

Acute osteomyelitis in a neonate: a case report

*Sónia Andrade Santos**, *Sandra Soares Cardoso*, *Joana Magalhães*, *Clara Diogo*, *Inês Balacó*, *Cristina Alves*, *and Isabel Andrade*

Pediatric Department, Centro Hospitalar Tondela-Viseu, Viseu, Portugal

Abstract

Introduction: Acute osteomyelitis is rare in neonates and remains a diagnostic and therapeutic challenge. **Case report:** Female neonate, 25 days old, assessed after presenting with a limp right arm, irritability, and pain from that very day. Spontaneous movements of the right arm were absent, with no signs of inflammation or trauma, no markers of inflammation, and normal arm radiography. She was admitted for monitoring, maintaining pseudoparalysis. On the second day, she presented with fever, positive markers of inflammation and an ultrasound suggesting right humerus osteomyelitis. She was started on cefotaxime and vancomycin. MSSA was isolated in the blood culture. She was transferred to a tertiary hospital due to loss of venous access and hospitalized on flucloxacillin. She completed six weeks of intravenous antibiotics and was discharged after 43 days, having improved. Radiography showed signs of bone remodeling and she was discharged without sequelae, with an Orthopedics follow-up consultation in one year. **Discussion:** Early diagnosis and prompt treatment may prevent complications. The authors highlight the importance of diagnostic suspicion, even in neonates with no risk factors.

Keywords: Osteomyelitis. Neonate. Staphylococcus aureus.

Osteomielite aguda em recém-nascido: um caso clínico

Resumo

Introdução: A osteomielite aguda é rara no período neonatal, constituindo um desafio diagnóstico e terapêutico. **Relato de caso:** Recém-nascida de 25 dias, avaliada por membro superior direito (MSD) pendente, dor à mobilização e irritabilidade desde o próprio dia. À observação sem mobilidade ativa do MSD, sem sinais inflamatórios ou lesões traumáticas, parâmetros inflamatórios negativos e radiografia sem alterações. Internada para vigilância, mantendo pseudoparalisia. Febre em D2, parâmetros inflamatórios positivos e ecografia sugestiva de osteomielite do úmero direito, iniciando cefotaxima e vancomicina. Isolado MSSA na hemocultura. Transferida para hospital terciário por perda de acesso vascular, internada sob flucloxacilina. Completou 6 semanas de antibioterapia endovenosa. Alta após 43 dias, melhorada, com sinais de remodelação óssea na radiografia, para consulta de Ortopedia, tendo alta após um ano, sem sequelas. **Discussão:** O diagnóstico precoce e tratamento adequado são fundamentais para evitar complicações. Salienta-se a importância da suspeição diagnóstica, mesmo em recém-nascidos sem fatores de risco.

Palavras-chave: Osteomielite. Recém-nascido. Staphylococcus aureus.

***Correspondence:**
Sónia Andrade Santos
E-mail: soniaandradesantos91@gmail.com

Received: 19-10-2024
Accepted: 17-09-2024
https://pjp.spp.pt

Available online: 25-06-2025
Port J Pediatr. 2025;56(3):182-186
DOI: 10.24875/PJP.23000045

Keypoints

What is known
- Acute osteomyelitis is rare in neonates.
- *Staphylococcus aureus* is the most common pathogen in neonatal osteomyelitis.
- Intravenous antibiotics are first-line treatment, and must be adjusted according to the bacteria and antibiotic sensitivity test.

What is added
- A case with a rare location of osteomyelitis of the humerus.
- Neonate with no risk factors for acute osteomyelitis and no indications from laboratory or imaging tests at the onset of symptoms.

Introduction

Osteomyelitis is an inflammatory process of the bone and marrow, usually resulting from bacterial infection, which can be classified as acute when symptoms are present for less than two weeks[1]. Children under five years old account for approximately 50% of the pediatric cases of osteomyelitis, with a male/female ratio of 2:1. For neonatal osteomyelitis, an estimated incidence of 1-7/1000 hospital admissions has been reported[1,2]. Although uncommon, it can result in severe long-term consequences such as joint destruction and growth failure, especially if not diagnosed and treated early[3].

The most common mechanism of infection is hematogenous inoculation of the bone during an episode of bacteriemia, but it can also result from direct inoculation or be spread from a contiguous site of infection[4]. Risk factors include prematurity, trauma, sepsis, bacteriemia, previous central venous catheter or chronic catheterization, and immunodeficiency[5].

Osteomyelitis most frequently involves the metaphysis of long bones, mainly in the lower limbs, with femur and tibia accounting for about 50% of all cases. The rich metaphyseal blood supply, with vascular loops and turbulent flow, facilitates bacterial colonization. *Staphylococcus aureus* is the most common pathogen in neonatal osteomyelitis, found in 70-90% of positive culture cases[5,6].

The classic presentation is fever, localized signs of swelling, pain, and limitation of movement. Diagnosing osteomyelitis in neonates in the early stages of the disease can be challenging because clinical presentation is nonspecific. As a result, treatment is often delayed[1,4].

We present the case of a healthy newborn with no known risk factors, with acute osteomyelitis of the humerus, a rare location, to demonstrate the importance of a high index of suspicion to identify and treat this condition early.

Case report

Female newborn; pregnancy monitored by a private Obstetrician and Primary Health Care with no events referred; third trimester serologies with no sign of infection, negative Group B *Streptococcus*, and three normal prenatal ultrasounds. She was born by cesarean section at 41 weeks of gestation, with an Apgar score of 9/9/10. Admission to the maternity ward was uneventful and she was discharged on the third day as clinically well. No incidents were mentioned during the first three weeks of life.

On the 25th day of life the newborn was brought to the pediatric emergency department of a local level II hospital because her mother noticed the right arm became limp from that very day, with irritability and discomfort when manipulated. There were no signs of fever, feeding intolerance, swelling, or flushing, and no history of trauma. The neonate exhibited a limited and painful range of motion in the right shoulder and elbow, with an absence of spontaneous movements in that arm, but active mobility was maintained in the wrist. There was no evidence of focal tenderness, inflammation, or trauma in the shoulder, arm, or elbow. Movements in the left arm remained within the typical frequency and range. Considering the diagnostic hypotheses of acute osteomyelitis, septic arthritis, or trauma, laboratory blood tests were conducted, revealing a C-reactive protein (CRP) level of 1.18 mg/dl and a procalcitonin level of 0.03 mg/dL, with other values within normal ranges. Plain radiography of the right arm was performed, showing normal results, and she was seen by Orthopedics. A blood culture sample was collected.

She was hospitalized for monitoring at the Special Care Unit for Newborns, with paracetamol for pain control. Twelve hours after admission, clinical examination and blood tests were similar, and a second blood culture sample was collected.

On the second day of hospitalization, with pain and pseudoparalysis persisting in the right arm, she presented with fever and an increase in markers of inflammation (CRP 4.1 mg/dl). An ultrasound was performed, suggesting osteomyelitis of the right humerus, with no signs of adjacent septic arthritis (Fig. 1). She was started on empiric intravenous (IV) antibiotic therapy

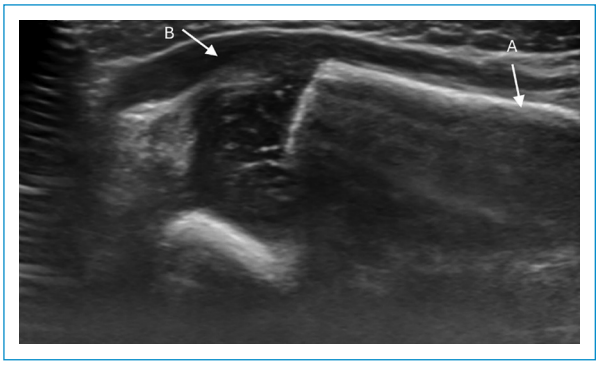

Figure 1. Soft-tissue ultrasound with signs of acute osteomyelitis of the right humerus (**A**) and no signs of joint effusion (**B**).

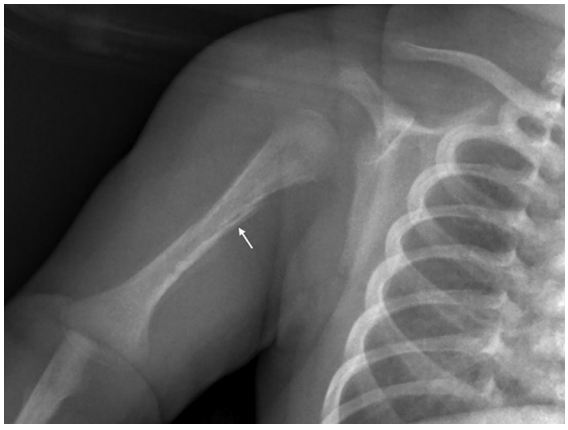

Figure 2. Anteroposterior radiograph showing signs of pandiaphysitis of the right humerus, with irregular periostitis and possible cortical rupture.

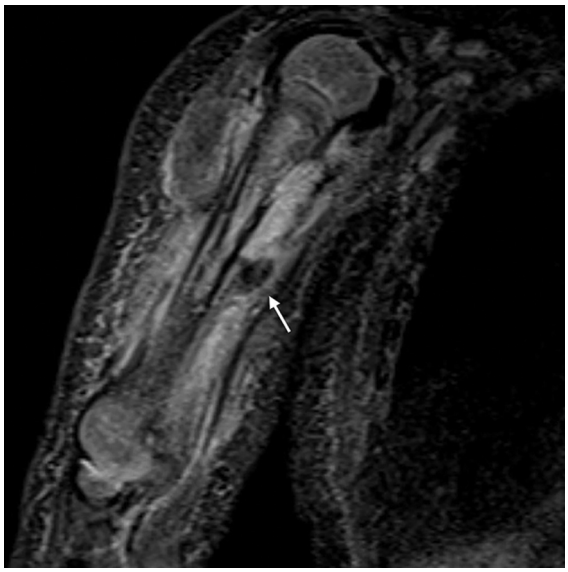

Figure 3. MRI coronal section of the right humerus, showing extensive alterations in the muscle groups of the right arm, medullary signal abnormality of the humerus, with extensive periosteal reaction and multiple collections adjacent to the bone suggesting infection, the largest of which measures approximately 16 × 6 mm.

with cefotaxime and vancomycin, with clinical improvement and no fever after 48 hours. On the fifth day, the result of the first blood culture was positive for meticillin-sensitive *Staphylococcus aureus* (MSSA), so cefotaxime was suspended. On the eleventh day, due to loss of peripheral venous access sites and the need for a central access site to ensure full IV antibiotic treatment, she was transferred to the tertiary referral hospital. Upon admission, a radiograph of the humerus was performed, showing signs of pandiaphysitis, with irregular periostitis and possible cortical rupture (Fig. 2). A multidisciplinary team from Pediatric Orthopedics, Pediatric Infectious Diseases and Pediatrics decided on admission to the Pediatric Orthopedics Department with IV flucloxacillin (150 mg/Kg/day in three divided doses). A central venous catheter (CVC) was placed in the left internal jugular vein under general anesthesia, without incident.

Magnetic resonance imaging (MRI) was performed on the thirteenth day, showing extensive periostitis and multiple abscesses adjacent to the bone (Fig. 3). Surgical drainage was not required once she responded well and MSSA was identified in the blood culture, allowing targeted antibiotic therapy.

On the twenty-fifth day she had the CVC replaced due to swelling of the left hemiface, with the signs of inflammation resolving completely after the procedure.

She underwent a total of six weeks of IV antibiotic therapy (eight days of vancomycin and thirty-three days of flucloxacillin), showing progressive improvement clinically and in terms of laboratory testing (upon hospital discharge: sedimentation rate 16 mm/h, CRP < 0.04 mg/dl). She was discharged on the forty-third day, with signs of bone remodeling on the humerus in the radiography (Fig. 4A) and was referred for a Pediatric Orthopedics consultation.

After hospital discharge, she maintained good active and passive mobility of the right upper limb. She was discharged from Pediatric Orthopedics after one year of follow-up, without sequelae, and with a normal plain radiograph for her age (Fig. 4B), with her family physician continuing to monitor her.

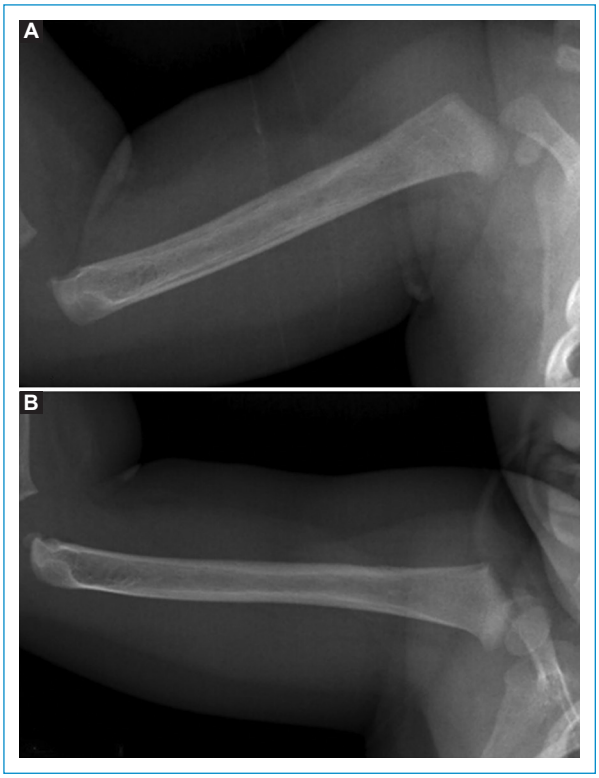

Figure 4. **A**: radiography showing signs of humeral remodeling with extensive periosteal reaction. Bone-within-a-bone appearance, expected in the context of acute osteomyelitis at this age. **B**: normal radiograph for age with adequate corticalization.

Discussion

The diagnosis of osteomyelitis in neonates can be challenging because of its nonspecific clinical presentation and normal radiograph in the early stages. As a result, treatment is often delayed. The outcome is dependent on rapid diagnosis and the immediate initiation of treatment[7,8].

This case required a high index of suspicion from the medical doctors, as symptoms and signs were minor and nonspecific at first, and auxiliary examinations were normal on the first assessment. The location of osteomyelitis in the humerus is uncommon, especially in newborns with no risk factors or history of trauma. Admitting a patient for close monitoring, allowing prompt investigation and treatment as needed is always an option, and it was what allowed early diagnosis and the implementation of therapy.

Blood cultures allowed for the identification of *S. aureus*, the most common bacterial agent in osteomyelitis etiology in this age, and treatment was adjusted accordingly[9].

Ultrasound and MRI play a crucial role in the diagnosis and management of acute osteomyelitis: ultrasound is useful for recognizing fluid collections in joints and soft tissues, while MRI is beneficial for locating the lesion, providing valuable insights into the extent of bone involvement, monitoring the progression of the disease, and guiding appropriate treatment strategies[10].

Studies show that up to 90% of patients with an early diagnosis of osteomyelitis can be cured with conservative antibiotic treatment, especially when initiated within the first few days after the onset of symptoms. Surgery is usually not needed, as was seen in our case, unless aspiration or drainage is required, for instance in cases of abscesses not responding to antibiotics, which in some cases could delay recovery. IV antibiotics for four to six weeks is first-line treatment, but the duration and route of administration are currently under debate, and more studies are needed in neonates, whose full treatment must be administered through IV access[1,8]. This brought an additional challenge in this case, with the neonate being transferred to a tertiary hospital and undergoing a CVC twice, under general anesthesia, due to the patient's age and size. According to literature, 20% of patients with acute osteomyelitis treated with long-term IV therapy had two or more CVCs placed during their treatment, with the majority of the initial CVCs being removed as a result of catheter malfunction or catheter-associated bloodstream infection[11]. Despite these documented complications, and even though our patient displayed one of these, we maintained IV antibiotics for six weeks, as recommended in neonates.

Potential complications of acute osteomyelitis include septic arthritis, subperiosteal abscess, pyomyositis, deep vein thrombosis, sepsis, and multiorgan failure. Although the mortality rate is less than 1%, it is crucial to recognize that permanent disabilities can still occur, such as growth arrest with limb length discrepancy, chronic pain, or rigidity. Moreover, acute osteomyelitis can evolve to the chronic form[6]. In our case, subperiosteal abscesses responded well to antibiotic therapy and no other complications or morbidities were recorded.

This case had a good outcome, probably due to early diagnosis, which prevented involvement of the growth plate and epiphysis. The blood culture was positive for MSSA, which allowed for targeted antibiotic therapy, which could be adjusted as soon as the culture result was provided. Correct treatment was administered with a total of six weeks of IV antibiotic therapy, five of which included 150 mg/kg/day of IV flucloxacillin (the dosage for osteoarticular infection). The authors highlight the importance of diagnostic suspicion, even in neonates with no known risk factors, and the work of a multidisciplinary team in a rare and challenging case like this.

Acknowledgements

The authors wish to express their appreciation for the collaboration of the colleagues involved in the multidisciplinary care and their overall contribution to the decision-making process.

Previous presentations

Oral presentation in 49º Congresso Português de Neonatologia, 2021.

Author contributions

S. Andrade Santos: Conception and design of the study, report, review or other type of work or paper; Agreement to be accountable for the accuracy or integrity of the work. S. Soares Cardoso: Acquisition of data either from patients, research studies, or literatura; Analysis or interpretation of data either from patients, research studies, or literature; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work; J. Magalhães: Analysis or interpretation of data either from patients, research studies, or literature; Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work. C. Diogo: Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work. I. Andrade: Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work.

Funding

There were no external funding sources for the writing of this paper.

Conflicts of interest

The authors declare that there were no conflicts of interest in drafting this paper.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

1. Saavedra-Lozano J, Falup-Pecurariu O, Faust SN, Girschick H, Hartwig N, Kaplan S, et al. Bone and joint infections. Pediatr Infect Dis J. 2017 Aug;36(8):788-99.
2. Riise ØR, Kirkhus E, Handeland KS, Flatø B, Reiseter T, Cvancarova M, et al. Childhood osteomyelitis-incidence and differentiation from other acute onset musculoskeletal features in a population-based study. BMC Pediatr. 2008;8:45-54.
3. Fisher RG. Neonatal osteomyelitis. Neoreviews. 2011;12(7). DOI: 10.1542/neo.12-7-e374.
4. Thakolkaran N, Shetty AK. Acute hematogenous osteomyelitis in children. Ochsner J. 2019;19(2):116-22.
5. Popescu B, Tevanov I, Carp M, Ulici A. Acute hematogenous osteomyelitis in pediatric patients: epidemiology and risk factors of a poor outcome. J Int Med Res. 2020;48(4). DOI: 10.1177/0300060520910889.
6. Chiappini E, Mastrangelo G, Lazzeri S. A case of acute osteomyelitis: an update on diagnosis and treatment. Int J Environ Res Public Health. 2016 May 27;13(6):539.
7. Kiechl-Kohlendorfer U, Griesmaier E. Neonatal osteomyelitis. Neonatal Bact Infect. 2013;12:33-9.
8. Zhan C, Zhou B, Du J, Chen L. Clinical analysis of 17 cases of neonatal osteomyelitis: a retrospective study. Medicine (Balt). 2019;98(2):14129.
9. Street M, Puna R, Huang M, Crawford H. Pediatric acute hematogenous osteomyelitis. J Pediatr Orthop. 2015;35(6):634-9.
10. Thomsen I, Creech CB. Advances in the diagnosis and management of pediatric osteomyelitis. Curr Infect Dis Rep. 2011;13(5):451-60.
11. Ruebner R, Keren R, Coffin S, Chu J, Horn D, Zaoutis TE. Complications of central venous catheters used for the treatment of acute hematogenous osteomyelitis. Pediatrics. 2006;117(4):1210-5.